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Factsheet

DAYNEUTRAL STRAWBERRIES

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Dayneutral strawberries are uniquely different from Junebearing types and older everbearers. Dayneutrals have the capacity to flower and fruit continuously which is attributed to their insensitivity to daylength which normally controls flower initiation. They form flower buds under any daylength and continue to grow as long as temperatures are suitable. Dayneutrals produce a fall crop the year of planting; in subsequent years, the production cycle peaks every 6 weeks from June onwards. After the first year, the spring crop starts about 4 to 7 days before the early season Junebearers (e.g., 'Veestar').

Dayneutrals vary in their ability to flower during the summer, and have been classified as either weak, intermediate or strong. 'Tribute' and 'Tristar' are strong dayneutrals because they flower profusely and runner sparsely during the summer. Flowers will also form on runners. Plants tend to be small with a moderate number of crowns that produce small leaves. Intermediate and weak dayneutrals, such as 'Selva', have more of the Junebearing characteristics, such as a stronger tendency to runner in summer.

Modified cultural systems are necessary to produce high-quality, high-yielding dayneutral strawberries. Some growers have had poor success with dayneutral cultivars because they have treated them as conventional Junebearers. Research during the last several years has shed new light on how to grow dayneutrals as a commercial crop. This Factsheet is intended to provide growers with the latest information on dayneutral culture.

Figure 1. 'Tristar' fruit in pint containers

EXPECTATIONS

Total yields of dayneutrals are quite high. At 50,000 plants/ha (20,000/ac), yields of more than 34 t/ha (30,000 lb/acre) are attainable the year of planting and in subsequent years. Occasionally the first year's crop may be larger than the second, while in other years the opposite may be true. Hot summers seem to be more detrimental to second-year plantings. Not all of this production is marketable because some berries are small, damaged by tarnished plant bug or rotten. Observations over several years suggest that a reasonable marketable yield for a well-managed bed is 13.5 t/ha (12,000 lb/ac). In the second year, at least half the fruit ripens with the June crop, and the remainder is spread throughout the later growing season.

One of the major decisions a dayneutral strawberry grower must make is whether to grow them as an annual or a perennial crop. Annual culture is more expensive in terms of plants and site preparation. However, weed and pest control is less of a problem, mulching for winter protection is not required, and the production peaks can be staggered so that more consistent production is realized. By the third year, management becomes extremely difficult, as plants are too thick, and weed and pest problems are too great. Consequently, fruiting for three consecutive years is probably not economical.

MARKETING

Few growers will be successful selling dayneutrals through 'pick-your-own' retail. Consumers do not expect strawberries to be available later than July. Therefore, the grower must pick the berries and market them. The berries that are too small for the fresh market can be frozen.

The intense flavor and color of the dayneutral are well accepted by buyers. Experience has shown that growers must market dayneutrals as being something special (i.e., not the typical strawberry shipped in from the U.S.A.). Over the last several years, prices have been at least twice as high in late summer compared to June. Successful marketing outlets have been restaurants, roadside stands, farmers' markets and wholesaling to grocery chains. The most successful growers tend to market their crop near large cities and specialize in relatively few crops; the attention required by dayneutral strawberries restricts the number of other crops a grower can produce.

SITE SELECTION, PREPARATION AND FUMIGATION

When a site is selected for planting, several factors

must be considered. These are soil, surface drainage, availability of irrigation water, exposure and previous crops. The land should be cleaned of weeds, the pH adjusted where necessary, the nutrient levels optimized and soil fumigation considered.

Fumigation aids in control of nematodes, soil insects, soil diseases, and weeds, and should be done in the fall prior to the planting year. For further information read OMAF Publication 513, *The Strawberry in Ontario*, or contact your local Horticultural Crop Advisor.

CULTIVAR SELECTION

'Tribute' and 'Tristar' are higher yielding dayneutral cultivars in eastern North America than 'Fern' or 'Selva'. These latter two cultivars have firm fruit and good fall production, but their quality is not as high as that of the former two. 'Brighton', 'Aptos' and 'Hecker' do not perform well in Ontario, while 'Yolo', 'Mrak' and 'Muir' have not been thoroughly tested.

Tristar Plants have moderate vigor resulting in small to medium plant size. Leaves and crowns are resistant to powdery mildew, moderately tolerant to leaf scorch, but susceptible to leaf spot. In the planting year, 'Tristar' has a production peak in late August. In subsequent years, it produces two equal crops, one in June and the other through the summer. Yields in the first year are usually less than 'Tribute', but second-year yields are equivalent.

Fruit flesh and skin are very firm, and berries are glossy red at harvest. Internal color is a deep red throughout. Its flavor is excellent and ranks with the best of the Junebearing types. Berry size is related to temperature, with warm temperatures associated with small size, and cooler temperatures with medium size. Berry shape is conical and considered by many to be ideal.

Tribute Plants have high vigor resulting in medium-sized plants. Leaves are resistant to powdery mildew and tolerant to leaf scorch, but susceptible to leaf spot. In the planting year, 'Tribute' peaks in September after 'Tristar', and in subsequent years produces a large June and summer crop which coincides with 'Tristar'.

Fruit flesh and skin are very firm, but the color is not as intense as that of 'Tristar' and often has a white collar below the calyx. Fruit shape is more rounded than 'Tristar', often being wedge-shaped with pronounced shoulders. Its flavor is not as strong as 'Tristar', but size is larger.

SUPPLY OF PLANTS

Growers must ensure that healthy plants are used to start a new planting. Buy plants only from certified plant propagators, a list of which can be obtained through your local Horticultural Crop Advisor.

There will be a shortage of dayneutral plants for several years to come, so growers are advised to order their plants early to ensure their supply. Dayneutral nursery stock is difficult to propagate, as plants produce few runners and need to be started from tissue culture to get the best multiplication rates. Secondly, propagators will need to supply more plants than with conventional Junebearers because of the required high plant densities and short life of the planting.

BED PREPARATION

Dayneutrals respond well to raised beds with trickle irrigation and black plastic, similar to the California system. The raised bed and black plastic allow the root system to warm in spring, while the trickle irrigation lines provide water and nutrients. Use of black plastic can increase yields by up to 50% in the first year compared to unmulched plantings. It also reduces evaporation and so lessens the volume of water needed. Weed competition is almost eliminated with the use of black plastic.

Some studies suggest that black plastic may cause excessive heat buildup in summer, resulting in reduced berry size. This can be prevented by using white-on-black plastic, or covering the black plastic with straw when soil temperatures warm.

If black plastic and raised beds are not a viable option, then a flat bed may be used if the soil is thoroughly worked.

PLANTING SYSTEM AND EARLY CARE

Dayneutrals perform best when planted at high densities and with runners removed. A staggered double row with plants set 20 cm (8 in.) apart, offset 10 cm (4 in.) from center, with 1.2 m (4 ft.) between row centers, is a very efficient planting design. At plant densities of 50,000/ha (20,000/ac), double rows yield 30% more than single rows.

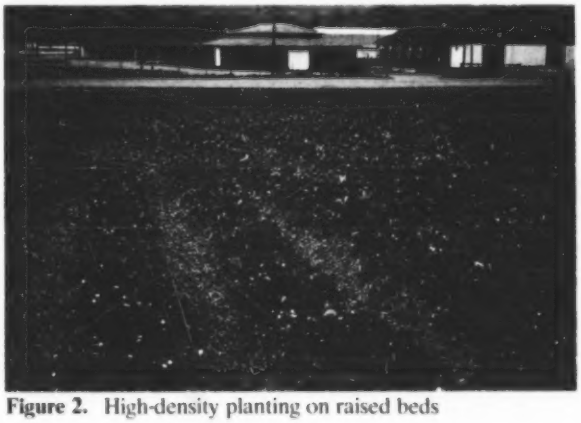

Figure 2. High-density planting on raised beds

If a grower intends to raise dayneutrals as an annual crop, then plant densities can be increased even further to a 12 cm (5 in.) spacing without sacrificing much yield per plant.

Research has shown that dayneutrals have higher yields and larger berries when mulched. If plants are set through plastic, the mulch is already in place. If plants are set on a flat bed, then place weed-free straw around them. This will help plants to become established, cool the soil and retain moisture.

Staggered planting dates can help spread the harvest season in the first year and reduce the weekly variation in yield. Plants set early in spring (first week in May) will reach peak production 12 to 14 weeks later (late August). Therefore, higher yields can be obtained later in the season by planting a portion of the field in June.

Remove runners from all plants throughout the season. Runnering decreases markedly after fruiting begins, so while this task is somewhat intensive early in the season, it becomes insignificant later.

Flowers should be removed for 6 weeks following planting to allow the plants to achieve sufficient size for fruiting. Failure to remove flowers will result in small

plants and low yields. Extending the period of flower removal beyond 6 weeks will result in larger plants, berries and second-year yield, but less production in the first year. Varying the flower removal period will not affect the timing of production peaks.

NUTRITION

Dayneutrals benefit from a continuous supply of nitrogen and potassium. Additional phosphorus is not necessary provided an adequate supply has been incorporated before planting.

A large amount of fast-acting nitrogen fertilizer applied at any one time to dayneutrals can soften fruit and cause excessive vegetative growth. There are 3 ways to avoid this yet supply adequate nitrogen during the season. The first is to apply 34 kg/ha (30 lb/ac) of nitrogen at monthly intervals throughout the growing season. Be careful not to allow the fertilizer to accumulate on the leaves, especially if they are wet. The second way is to use a slow-release fertilizer at planting. The third option is to apply 5 kg/ha (or 5 to 6 lbs/ac) of nitrogen through the drip irrigation system every week. Calcium nitrate is the preferred source of nitrogen early in the season, but urea can be substituted when temperatures warm.

On soils that are low in potassium, such as sandy soils, supplement the preplant potassium with 11 kg/ha (10 lb/ac) of K_2O at monthly intervals or 2 kg/ha (2 lb/ac) at weekly intervals through the drip irrigation system during the growing season.

Dayneutrals tend to be heavy consumers of boron because of their large commitment to reproduction. Monitor leaves occasionally to ensure that boron levels do not fall below 30 ppm. An application of 2 kg/ha (2 lb/ac) solubor may be required in midsummer if boron levels are too low. The phosphorus/zinc ratio in the leaves should remain below 140, and the zinc level above 20 ppm. Because phosphorus hinders zinc uptake, balanced fertilizers containing phosphorus are not recommended if the soil has been amended properly before planting.

SECOND FRUITING YEAR

Some growers retain their dayneutral plantings for a second year, particularly if a companion crop of Junebearers is short. If plants are to be held over for a second year, a herbicide should be applied in late November prior to mulching with weed-free straw. The straw should be removed before the end of March and placed between the row.

Because of the dayneutral's smaller berries, low price in June and associated labor problems, some growers may wish to dispense with the June crop. To do this, growers should mow the plants to within 5 cm (2 in.) of the crown at first petal fall. This practice will eliminate the June crop and give a somewhat smaller August crop, but a larger late-September crop. Overall, yields will be reduced by about one quarter. If plants are to be mowed in the second year, then timing is important; studies have shown that mowing earlier or later than first petal fall will reduce yield.

Some runners develop in spring of the second year, but these can be tilled under if they reach into the aisle. Selective runner removal is not practical in the second year.

Nutrient requirements for the second year are similar to the first, except that fertilizer applications should begin in April or early May rather than after planting.

Second-year plantings become noticeably less productive in September, compared with first-year plantings which remain vigorous.

WEED CONTROL

Weeds can be a major problem in dayneutral plantings. These plants tend to be smaller and less competitive than Junebearers. Good preplant preparation is essential for good weed control. Black plastic mulch will reduce the weed growth, except in the immediate area of the plant and the aisles. The weeds near the plant can be removed easily during harvest and the aisles can be kept clean with a herbicide.

Where black plastic is not used, herbicides may be applied at or soon after planting. High rates of some preemergent herbicides may reduce growth on some soils. Also, the days-to-harvest restrictions of pesticides require that growers apply herbicides soon after planting. For further information on weed control, contact your local Horticultural Crop Advisor.

PESTS AND DISEASES

The biggest insect-pest problem is the tarnished plant bug. Populations of this insect increase during the summer. As one of their preferred foods is the strawberry flower, failure to control this pest will result in nubby berries. The greenish nymphs do most of the damage to flower parts. These can be monitored by shaking flower clusters over a white saucer and counting the nymphs. Control measures are warranted if more than 2 nymphs are observed per foot of row, and must be applied every 10 days. If insecticides are used, they should be of negligible toxicity to bees; they are best applied in the evening after bees return to their nests. The days-to-harvest restrictions of the insecticide used may present scheduling problems for picking. The grower may have to treat only a portion of a field each day to accommodate these intervals. For further information on control of tarnished plant bug, contact your local Horticultural Crop Advisor or Pest Management Specialist.

Gray mold is the biggest disease problem of dayneutral strawberries. Because berries are continuously present, mold inoculum tends to increase during the season. Remove moldy berries from the planting, and protect flowers every 10 days to 2 weeks with an application of fungicide, especially after rainy periods. Some growers find that fungicide sprays can be reduced during the warmer periods of July and August, particularly on black plastic.

'Tribute' and 'Tristar' are susceptible to leaf spot but partially resistant to leaf scorch and mildew; however, these diseases will not present a major problem in annual crop plantings.

IRRIGATION SYSTEMS

Ideally both overhead and trickle irrigation should be available. Use the trickle system to apply water and nutrients and to cool the soil. Use the overhead irrigation system to protect the crop from frost in spring and fall and cool the plants.

Tensiometers are excellent for monitoring soil moisture. Readings should be maintained at less than 50 centibars in most loamy soils and less than 20 on sandy soils. If water is provided by overhead irrigation only, apply 5 cm

(2 in) per week during the summer months. With trickle irrigation, daily applications of water will best maintain the correct soil moisture, particularly under black plastic. On sandy soils, rates of 5 L/m^2 (0.1 gal/ft^2) per day have been required under black plastic. Without mulch, rates of up to 37 L/m^2 (0.75 gal/ft^2) per day have increased yields.

Some growers report that cooling plants when temperatures increase over 30°C significantly improves berry size and quality. Start overhead irrigation when the temperature rises above 28°C. Apply in short cycles sufficient to wet the foliage and fruit. This practice will reduce disease pressure.

HARVESTING

Dayneutrals should be harvested only after they are fully ripe to allow maximum flavor to develop. During the spring and summer, berries should be picked twice a week. Later in the season the rate of ripening slows and a one-week harvest interval may suffice.

Pick dayneutrals and place into pint containers to avoid compressing the berries on the bottom. Also, the dayneutral strawberries in pint containers look proportionately like Junebearers in quart containers. Pick the rotting and small berries from the field separately to avoid contaminating the healthy fruit.

Cool the berries immediately after harvest if they are to be held overnight. Temperatures near 0°C are optimal. Wrap flats in plastic after most of the field heat has been removed, and do not remove the plastic until the berries inside the flats have warmed to the temperature of the display. This practice will minimize condensation on the fruit, and prolong shelf life.

ECONOMICS

One of the major considerations before a grower plants is the return expected from the crop. Detailed costs of production are being prepared and will be published shortly. For further information, contact your local Horticultural Crop Advisor.

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